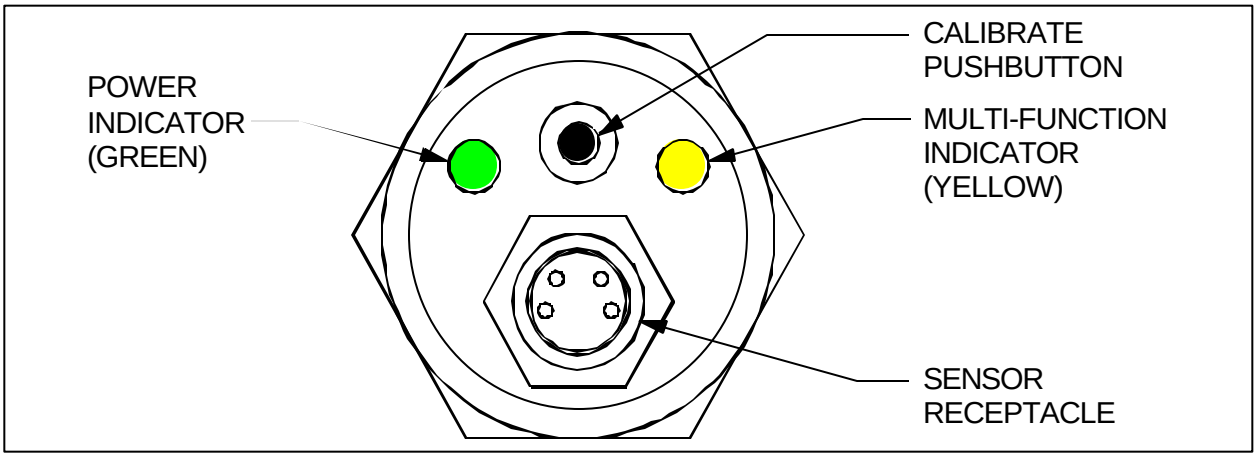
# OPERATING INSTRUCTIONS

## MODEL **SC200 & SC201** SENSOR CONTROLLER




The Prime Controls Model SC200 and Model SC201 Sensor Controllers are comprised of a microprocessor based control module in an 18 mm threaded aluminum housing that can be connected to a variety of sensors through a 12 mm receptacle at the face end. A four-pole connector at the rear end provides connections for power, ground, sourcing output, and sinking output. Status and setup controls on the face include a green power indicator, a yellow multi-function indicator and a pushbutton switch.

The controller requires a dc power source in the voltage range of 12 to 24 volts at 100 mA.
The pin-out is as follows:

| | | | |
|---|---|---|---|
| Pin 1 | - | Power | Brown wire on standard cable |
| Pin 2 | - | Sinking Output | White wire on standard cable |
| Pin 3 | - | Common | Blue wire on standard cable |
| Pin 4 | - | Sourcing Output | Black wire on standard cable |

When power is applied, the green indicator is solidly ON.

During normal sensing operation, the yellow indicator tracks the state of the sinking and sourcing outputs. When the indicator is ON, the sinking output is low (sinking current) and the sourcing output is high (sourcing current). In meter mode, the yellow indicator flashes at a rate proportional to the strength of the signal from the attached sensor. During calibration, the yellow indicator flashes at various rates to indicate the status of the process as described later in this document.

The small calibrate pushbutton mounts flush with the face of the unit to insure no inadvertent activations that can cause loss of calibration.

## METER MODE

The Controller provides a feature for monitoring the strength of the signal from the attached sensor. To invoke “meter” mode, press and hold the pushbutton switch for three or more seconds. When the switch is released, the yellow indicator begins flashing at a rate proportional to the strength of the sensor signal. For minimum or no signal, the flash rate is approximately 1 Hz. For maximum signal, the flash rate is approximately 25 Hz.

Press and release the pushbutton to exit meter mode. The yellow indicator reverts to following the outputs.

The gauging function of the controller remains active during meter mode. As the sensor signal moves above and below the calibration threshold, the outputs switch accordingly, independent of the state of the yellow indicator.

## YELLOW INDICATOR INTERPRETATION

The yellow indicator provides information about the state of the controller. During normal gauging, the state of the yellow indicator follows the outputs directly. When the outputs are ON, the yellow indicator is ON, and vice versa.

In meter mode, the yellow indicator flashes at a rate proportional to the strength of the signal from the attached sensor. For minimum or no signal, the flash rate is approximately 1 Hz. For maximum signal, the flash rate is approximately 25 Hz.

During one-sample calibration, the yellow indicator turns off momentarily, and then if calibration is successful, the indicator flashes 4 times in succession at a 5 Hz rate then reverts to following the state of the outputs. If calibration is not successful (the sensor signal is too weak), the yellow indicator flashes at a 10 Hz rate for 15 seconds or until the pushbutton is pressed again. If 15 seconds elapse with no repress, the indicator reverts to tracking the outputs.

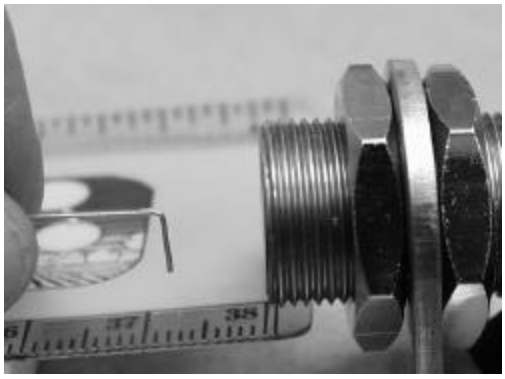
When two-sample calibration is invoked, the yellow indicator begins flashing indefinitely at a 2.5 Hz rate until the pushbutton is pressed for recording of the second calibration point. After the pushbutton is pressed for recording the second point, the indicator flashes 4 times in succession at a 5 Hz rate then reverts to following the state of the outputs.

## PUSHBUTTON COMMANDS

The calibration pushbutton allows control of the operational mode of the controller as follows:

1. From gauge mode, tap and release within 0.7 seconds, calibrates on current conditions or bad calibration, enters error reporting mode.
2. From error mode, tap the pushbutton once to retry calibration.
3. From gauge mode, tap the pushbutton twice within 0.7 seconds, enters two-sample calibration mode and records the first point. A third tap records the second calibration point, installs the new calibration and exits calibration mode.
4. From gauge mode, hold the pushbutton in for at least three seconds, the controller enters meter mode.
5. From meter mode, tap the pushbutton once to exit meter mode.

## CALIBRATION



The Controller offers two modes of calibration or “teach”, a one-sample mode and a two-sample mode. Both are invoked through the pushbutton on the face of the unit.

The one-sample mode simply sets the gauge threshold at 95% of the signal present at the time the pushbutton switch is pressed.

The latest calibration information is always stored in non-volatile memory and is restored at power-up.

### One-sample Calibration

1. Mount the sensor and place the object to be sensed in relation to each other to produce an “acceptable” condition. If necessary, use meter mode to establish the relationship.
2. Tap the calibration pushbutton.

If the calibration is successful, the yellow indicator flashes 4 times at a 5 Hz rate and then reverts to following the output. The new calibration value is stored in non-volatile memory.

If the sensor signal is too weak, the calibration may be unsuccessful. The controller indicates the failure by flashing the yellow indicator at a 10 Hz rate for 15 seconds or until the pushbutton is pressed again. If the pushbutton is not pressed within 15

seconds, the controller aborts calibration and re-installs the previous calibration parameters.

*Certain sensors may not initiate the failure indicator mode when ambient conditions cause a bias. To determine if calibration was successful remove the target. The amber lamp turns off. If the amber fails to turn off, calibrate the detector again. However this time hold the target closer during calibration. Use of the meter mode helps to minimize the potential of this occurrence.*

**Two-sample calibration**

Two-sample calibration may be used for two purposes: for looser or tighter control of the positioning of the gauge threshold and and/or to reverse the operational logic of the outputs. Two-sample calibration places the gauge threshold at the midpoint between the two recorded samples. Whereas the single-sample calibration always discriminates on a 5% change in signal relative to the sample point, the separation of sample points in the two-sample mode may vary according to the user's needs.

Inverting the gauge logic works as follows:

<u>Outputs ON with Stronger Signal</u>

1. Establish the calibration point at the weaker signal condition.
2. Tap the pushbutton twice in succession within 0.7 seconds. The first sample is taken and the yellow indicator begins flashing indefinitely at a 2.5 Hz rate.
3. Establish the calibration point at the stronger signal condition.
4. Tap the pushbutton once. The second sample is taken, the new threshold installed, and the yellow indicator flashes four times at a 5 Hz rate and then reverts to following the outputs.

The outputs will now be ON for a stronger signal and OFF for weaker signals.

<u>Outputs ON with Weaker Signal</u>

1. Establish the calibration point at the stronger signal condition.
2. Tap the pushbutton twice in succession within 0.7 seconds. The first sample is taken and the yellow indicator begins flashing indefinitely at a 2.5 Hz rate.
3. Establish the calibration point at the weaker signal condition.
4. Tap the pushbutton once. The second sample is taken, the new threshold installed, and the yellow indicator flashes four times at a 5 Hz rate and then reverts to following the outputs.

The outputs will now be ON for a weaker signal and OFF for stronger signals.

**Model SC200 versus Model SC201**

*The difference is the output on time.*
The **Model SC200** output turns on after the part is present for a minimum of 8 mS. It remains on during the presence of the part. The **Model SC201** output turns on after the part is present for a minimum of 2 mS. It has a built-in pulse stretcher. It remains on during part presence and will not turn off until 25 mS has elapsed.

**Which to Choose**
When choosing the right controller, choose the Model SC200 for a slow operation and where 8 mS de-bounce is necessary to overcome the erratic motion of a part. Choose the Model SC201 were 2 mS de-bounce will not allow the detection of the lead edge of a part, multiple times and where the output must remain on for at least 25 mS to energize a relay coil or overcome a slow PLC scan time.

**SPECIFICATIONS**
**Power & Output**

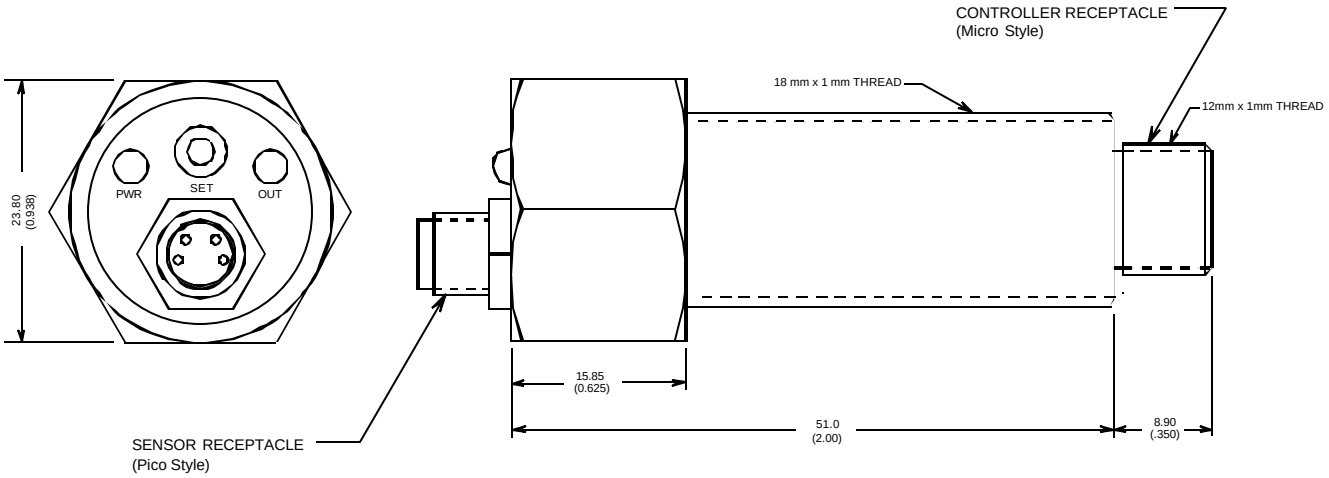
| | |
|---|---|
| Type: | DC |
| V+ Connection: | 12 mm Connector, Pin 1 |
| Common | 12 mm Connector, Pin 3 |
| Voltage: | 12 to 24 volts |
| Max Current: | 100 milliamps + sourcing output load |
| Protection: | Reverse polarity protected. |
| Min. Response Time | 8 mS part present time for Model SD200<br>2 mS part present time for Model SC201 |

**Logic Output Electrical Specifications**
**Sinking Output**

| | |
|---|---|
| Open Drain | |
| Connection: | 12 mm Connector, Pin 2 |
| Max. applied voltage: | 30 Volts, TVS limited |
| Max. current, momentary: | 40 Amps |
| Max. current, sustained: | 50 mA, fuse limited |
| Max. off state leakage @ 50 V: | 25 uA |
| Overcurrent protection: | Self resetting fuse. |
| ESD protection: | Transient Voltage Suppressor @ 30 Volts |
| Output On Time | Follows part present time in Model SC200<br>25 mS. minimum in Model SC201 (never is less with at least 2 mS. part present) |

**Sourcing Output**

| | |
|---|---|
| Connection: | 12 mm Connector, Pin 4 |
| Max. source current: | 50 mA, fuse limited |
| Output Voltage High: | Supply Voltage less 1 volt |
| Overcurrent protection: | Self resetting fuse |
| ESD protection: | Transient Voltage Suppressor @ 30 Volts |
| Output On Time | Follows part present time in Model SC200<br>25 mS minimum in Model SC201 (never is less with at least 2 mS part present) |




SC100, SC200 & SC201CONTROLLER HOUSING

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